

Atmos. Meas. Tech. Discuss., referee comment RC2
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Comment on amt-2022-57

Anonymous Referee #2

Referee comment on "Detection and localization of F-layer ionospheric irregularities with the back-propagation method along the radio occultation ray path" by Vinícius Ludwig-Barbosa et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2022-57-RC2>, 2022

Referee report on "Detection and Localization of F-layer Ionospheric Irregularities with Back Propagation Method Along Radio Occultation Ray Path", by Ludwig-Barbosa et al.

This paper investigates the detection and localization of F-layer ionospheric irregularities with the back propagation (BP) method. The most confusing me is that the authors listed the observations of the sporadic E layers from two COSMIC RO measurements in the 4.3 Analysis COSMIC occultations results, while Section 3. is the simulation of plasma bubbles in the F-region with the BP method. They even did not analyze the sensitivity level and estimation accuracy of sporadic E-layers since it is beyond the scope of this study (line 238). What is section 4.3 meant to explain? This may indicate that two or more irregularity regions occurred in the E region, but not the F-layer ionospheric irregularities. I suggest the authors analyze the F-layer ionospheric irregularities from the COSMIC RO measurements and compare the simulations and observations to validate the detection and localization estimate with BP method along radio occultation ray path. Otherwise, conclusions made here are not very convincing through only simulations. That is my main comment.

The descriptions about back propagation are too brief and incomplete in the text. Some recent similar work should also be referenced and mentioned. Figures 1 and 2 (but not limited to) are difficult for the reader to understand without detailed captions. Please add appropriate content and improve the diagram to make it easier for readers to read.

Please add appropriate text captions in Figures 6 and 7.

Minor comments

- Line 11¼□would it be better to change “two COSMIC occultations” to “two COSMIC occultation events”
- Line 21¼□“ in the lower atmosphere.” Delete “.”
- Line 40: The occurrence of EPB also shows stronger geomagnetic activity dependence, as shown by Abdu et al. (2018). <https://doi.org/10.5194/angeo-36-609-2018>
- Lines 41-42: Please reexamine carefully, it seems difficult to derive this description from the literature you cited.
- Figure 6: The last number on the Y-axis, 0, is half missing. Other pictures have similar problems. Please check it.
- Line 192: What does the abbreviation of "SLTA" stand for?
- Line 200: Please define the standard deviation (σ) clearly.
- Lines 22-223: I don't know how did you arrive at this “ $\sigma \square \square \rho / \rho = 3.0\%$ represents $S4 < 0.1$ ”. In addition, please show the reference or basis for the low scintillation threshold ($S4 = 0.2$).
- Line 242: by what threshold values are the irregularities still detectable?
- Line 243: “10km” -- > “10 km”. According to your function in **Line 207**, isn't it “-10 km”? Please check it in Figures 6, 11, 12, and 13 as well.